Aquatic Surveys and Assessment within the Butte BLM District

Prepared for the Bureau of Land Management, Butte FO
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by

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Aquatic Assessment Executive Summary

Project goals of the Aquatic Surveys and Assessment of the Butte BLM District were to: **1)** sample macroinvertebrates and riparian habitat at specified sites and **2)** to assess aquatic community data and identify possible reference condition or high biological integrity sites.

Macroinvertebrate samples, water quality parameters and habitat assessments were performed at 17 sites. Ten of these samples were shipped to the BLM Buglab (Logan, Utah) in early September, and 7 were processed and identified at the MTNHP Helena Lab. A revisit to the Deep Creek reach (tributary to the Big Hole River) for mussel surveys in August, revealed a thriving population (48 individuals/hour) of the western pearlshell mussel, *Margaritifera falcata* (a potential MT species of concern), which is a good community integrity indicator. Mussel surveys in the adjacent mainstem Bighole River reported only 1 ind. per hour for this species.

Habitat Surveys: Overall, the habitat assessments of the 17 sites showed good to excellent scores with both the EPA and BLM rapid field methods averaging 86% of the best possible. Only a couple of sites, Bigfoot Creek and Spring Gulch, were slightly-moderately impacted by cattle, while Camp Creek, High Ore and Indian Creeks from old mining activities. Muskrat, Lump Gulch, Fish and W.F. Jimmie New Creeks had nearly perfect BLM habitat scores and the highest EPA scores.

Macroinvertebrate Communities: The seven macroinvertebrate samples processed in Helena reported 89 taxa with no MT species of concern or BLM sensitive species. Although, Muskrat and W.F. Jimmie New Creeks had a high percentage of intolerant EPT taxa in their respective reaches. Average macroinvertebrate taxa richness per site was 40.1, with 49 taxa at the highest richness site (W.F. Jimmie New Creek) and 21 taxa at the lowest richness site (High Ore Creek). Macroinvertebrate samples taken at all seven sites were ranked as non-impaired with the DEQ MMI index scores ($\geq$ 63 for the mountain sites or $\geq$ 48 for the Low Mountains/Foothills sites).

Community Integrity results from the habitat and macroinvertebrate surveys of these 7 sites combined to rank the Muskrat Creek reach the most ecologically intact site, followed by W.F. Jimmie New Creek, State and Moose Creeks.

Acknowledgements

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We wish to thank those who assisted us with this project in the water, including field help from Marcie Butler (Field Tech BLM), Sarah LaMarr (Butte BLM FO), and Karen Walker (MTNHP). All photos in the report were taken by MTNHP personnel, unless otherwise noted.

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Cover Photo: Muskrat Creek downstream end of the reach.

Introduction

Project goals of the Aquatic Surveys and Assessment of the Butte BLM District were to: **1)** sample macroinvertebrates and riparian habitat at specified sites and **2)** to assess aquatic community data and identify possible reference condition or high biological integrity sites.

Butte District Stream Sites

Sarah LaMarr, Wildlife BIologist of the Butte BLM Field Office chose 20 potential sites (4/2005) within the BLM management, 17 were actually visited (Table 1). Two site classes were encompassed by these 17 sites, 8 in the Mountain and 9 in the Low Mountain/Valley (old Omernik Foothills designation) (Jessup 2005). Sites classified in the Low Mountain/Valley (LVAL) Index are located in the Middle Rockies Level III Ecoregion 17 (Woods et al. 2002) and the elevation is less than 5600 ft or 1700 m, the Mountain site class (MTN) is within this same ecoregion and elevation is >5600m.

Table 1. Site descriptions for the seventeen study sites included in the Butte BLM surveys.

Site	Site Code	Date Sampled	County	HUC	GPS Lat*	GPS Long*	Elev (ft)#	MTN / LVAL
Bear Creek	BearCr	7/7/2005	Deer Lodge	10020004	45.8771	-113.0697	5938	MTN
Bigfoot Creek	BigfootCr	7/26/2005	Silver Bow	10020004	46.1072	-112.1332	5278	LVAL
Camp Creek	CampCr	7/23/2005	Silver Bow	10020004	45.6564	112.6144	5278	LVAL
Deep Creek	DeepCr1	7/7/2005	Deer Lodge	10030101	45.9118	-113.1132	5879	MTN
Fish Creek	FishCr	6/23/2005	Jefferson	10020005	45.8062	-112.3722	5837	MTN
High Ore Creek	High_Ore	7/12/2005	Jefferson	10020006	46.2807	-112.2027	5323	LVAL
Indian Creek	Indicr	7/13/2005	Broadwater	10030101	46.3115	-111.6675	5301	LVAL
Jimmie New	Jim_New	7/7/2005	Silver Bow	10020006	45.8422	-112.9348	6814	MTN
LeMarche Creek	LaMarche	7/7/2005	Deer Lodge	10030101	45.8766	-113.1984	5846	MTN
Lump Gulch	LumpGul	7/23/2005	Lewis & Clark	10030101	46.4773	-112.0769	4734	LVAL
Medicine Rock Creek	MedRock	7/23/2005	Lewis & Clark	10030101	46.9288	-112.1504	4054	LVAL
Moose Creek	Moose	7/23/2005	Silver Bow	10020004	45.7419	-112.6734	5825	MTN
Muskrat Creek	MuskCr1	7/26/2005	Jefferson	10020006	46.3009	-112.0257	5624	MTN
Spring Gulch	SpringG	7/7/2005	Silver Bow	10020006	45.8365	-112.9176	6717	MTN
StateCreek	StateCr	7/26/2005	Silver Bow	10020004	46.1005	-112.1418	5364	LVAL
West Fork Jimmie New	WFJim	7/7/2005	Silver Bow	10030101	45.8398	-112.9512	6807	MTN
Whitetail Creek	Whitetcr	7/25/2005	Jefferson	10020005	45.9622	-112.1609	4054	LVAL

***GPS readings were taken from both the top and bottom of reach, only top GPS reading is reported here.**
 # taken from the GPS readings

Methods

Aquatic macroinvertebrate communities and riparian areas were inventoried and assessed using BLM / EPA (macroinvertebrates and habitat assessments) protocols and methodology. Reach lengths were a minimum of 100m, but were extended to 40x the stream wetted width (Barbour et al. 1999) or a maximum reach length of 250m. The reach was then divided into10 equally-spaced transects (e.g. 100m reach=transects 10m apart). All of the following procedures were performed within this study reach.

Habitat and Water Quality Collection and Analysis

Physical habitat measures: channel wetted width (in meters), channel depths recorded at ¼, ½ and ¾ wetted width at all transects (in centimeters), estimated riparian canopy coverage and substrate (in % size-class coverage per transect) based on Wollman size-classes were measured at each transect perpendicular to the stream channel.

Figure 1. Water Quality Measurements @ State Creek

A visual rapid habitat assessment (Barbour et al. 1999) based on 10 habitat variables (instream fish cover, epifaunal substrate, pool substrate characterization, pool variability, channel alteration, sediment deposition, channel sinuosity, channel flow status, bank condition, bank vegetative protection, riparian vegetated zone width) was completed for each sampled reach. The habitat quality scoring is based on a maximum score of 200. The LUI (Livestock Use Index) was also incorporated into the riparian habitat assessment, this involves a 75m zig-zag walk from the bottom of the reach on the left and right banks of the stream channel visually counting the number of cow pies, and noting if these are new or old (see BLM Assessment Sheet: http://www1.usu.edu/buglab/forms/Bug%20Protocol.pdf).

Specific conductivity, pH, water temperature and dissolved oxygen concentration were measured on-site prior to biological sampling with a Yellow Springs Instruments, Inc. model 85 water quality meter calibrated the night before sampling (Figure 1).

Macroinvertebrate Collection and Analysis

The two macroinvertebrate methods utilized were the EMAP_Targeted Riffle (8 composited surbers, area sampled= 0.744 sq. m) and the EMAP_Reach-Wide Multi-habitat for sites without defined shallow riffle areas (10 dipnets, area sampled= ~0.93 sq. m). These samples were taken June 23-July 26, 2005 following the standard EMAP field protocols (Lazorchak 1998), preserved in 95% ethanol and processed (sorting, identification & data analysis) by David Stagliano at the MT Natural Heritage Program Helena lab following protocols used by the BLM Buglab: http://www1.usu.edu/buglab/process/lab%20procedures.htm

Macroinvertebrates were identified to the taxonomic level specified by Montana DEQ (Bukantis 1998) and biological metrics were calculated from the data. Montana Department of Environmental Quality's newest multimetric macroinvertebrate (MMI) protocols (Jessup et al. 2005, Feldman 2006) were used to analyze the macroinvertebrate samples. Metric results were then scored using the Montana DEQ bioassessment criteria and each sample categorized as non-impaired or impaired according to threshold values.

The macroinvertebrate MMI score is based upon a series of metrics that measure attributes of benthic macroinvertebrate communities regarding condition changes to a stream system.

The macroinvertebrate metrics for the Mountain Stream Sites include:

- **Ephemeroptera Taxa (Score = (number Ephemeroptera taxa/10)*100):** number of taxa belong to the order Ephemeroptera.
- **Plecoptera Taxa (Score = (number Plecoptera taxa/7)*100):** number of taxa belonging to the order Plecoptera.
- **Percent Ephemeroptera, Plecoptera, and Trichoptera (EPT) (Score = (percent EPT taxa/90)*100):** These taxa represent the most sensitive taxa of mountain streams to degradation.
- **Percent Non-Insect Taxa (Score = ((28-percent non-insect taxa)/28)*100):** The percent of macroinvertebrate taxa that are not insects. Increased percentages of these taxa in mountain streams usually result from increased sedimentation, nutrient enrichment, and temperature (Jessup et. al. 2005).
- **Percent Burrower Taxa (Score = ((83-percent non-insect taxa)/71)*100):** Burrower taxa increase in mountain streams when there is an increase in fine sediment (Jessup et. al. 2005).
- **Hilsenhoff Biotic Index (HBI) (Score = ((7.5-HBI)/6)*100):** This metric was developed to measure changes in macroinvertebrate communities based upon nutrient enrichment. The HBI score increases with increased degradation (Jessup et. al. 2005).

The macroinvertebrate metrics for the Low Mountain/Valley Stream Sites include:

- **Percent EPT (excluding Hydropsychidae and Baetidae) (Score = (percent EPT (excluding Hydropsychidae & Baetidae)/71)*100):** This metric is the percent of the sample composed of the Ephemeroptera, Plecoptera, and Trichoptera taxa minus the Hydropsychidae and Baetidae families.
- **Percent Chironomidae (Score = (percent Chironomidae/40)*100):** This metric decreases with increasing degradation possibly due to a high number of sensitive chironomids found in samples collected at reference sites (Jessup et. al. 2005).
- **Percent Crustacea and Mollusca (Score = (20-percent Crustacea and Mollusca/20)*100):** This metric is the relative abundance of non-insect taxa found in a macroinvertebrate sample. The reason for using this metric is analogous to the "Percent Non-Insect Taxa" metric in the Mountain Index which increases with increased degradation (Jessup et. al. 2005).
- **Shredder Taxa Richness (Score = (7- Shredder Taxa Richness/7)*100):** This metric measures the number of shredder taxa in the macroinvertebrate sample. This metric increased with increased degradation in degraded low valley streams compared to reference streams.
- **Percent Predator Taxa (Score = Percent Predator Taxa/33*100):** This metric measures the percent of sampled macroinvertebrate taxa that are classified as predators. Predator taxa will decrease with increasing degradation that causes a shift in food resources.

The index score represents the condition of the macroinvertebrate community at the time the sample was collected representing that past year. If the index score is below the impairment threshold, the individual metrics can be used to provide insight as to why the communities are different from the reference condition (Barbour et. al 1999, Jessup et. al. 2005). The impairment threshold set by MT DEQ is **48** for the Low Mountain/Valley streams and **63** for the Mountain stream sites (Table 2).

Table 2. Impairment determinations from the MMI and O/E (RIVPACS) models (taken from Jessup 2005, Feldman 2006).

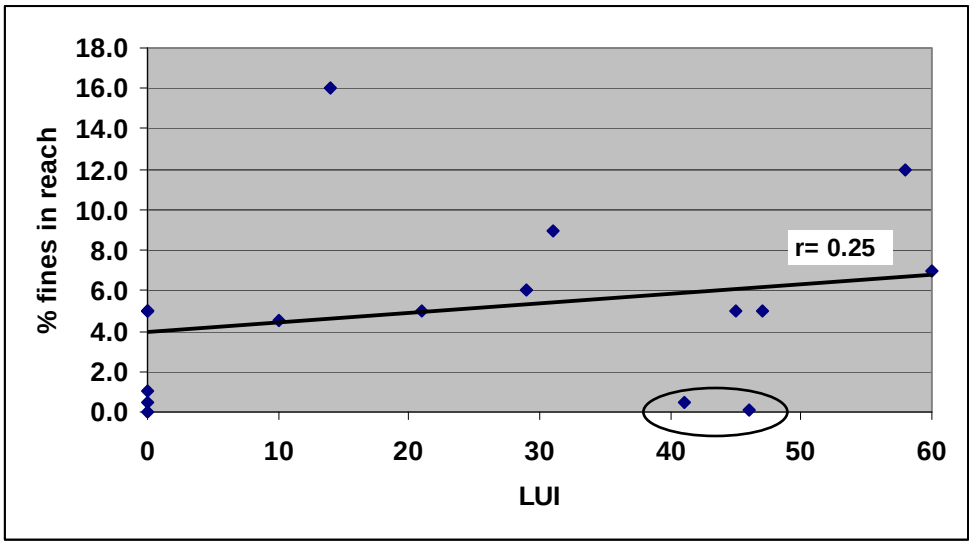
Ecoregion	RIVPACS	MMI	Impairment Determination
Mountain	≥ 0.8 or ≤ 1.2	≥ 63	Not impaired
	< 0.8 or > 1.2	< 63	Impaired
Low Valley	≥ 0.8 or ≤ 1.2	≥ 48	Not impaired
	< 0.8 or > 1.2	< 48	Impaired

RESULTS AND DISCUSSION

Habitat and Water Quality Results and Analysis

Muskrat, Lump Gulch, Fish Creek and W.F. Jimmie New Creeks scored highest in habitat quality with both the BLM and EPA HQI RBP assessment protocols, representing >95% & >90% of the best possible scores, respectively (Table 3). Bigfoot Creek and Spring Gulch had the lowest habitat scores with the EPA HQI because they were slightly-moderately impacted by cattle, accordingly the Livestock Use Index (LUI) was the highest at these sites (Table 3). LaMarche and Deep Creek also had a high LUI and this could be the cause of some decrease in the HQI indices at these sites, although these are larger streams and localized cattle impacts aren't as noticeable as in some of the smaller streams. Cattle crossings in reaches of streams can greatly increase local fine sediments, but the relationship of % fine sediments with the LUI in these streams was increasing but not significant ($p>0.05$) (Figure 2). Although some of this lack of response is that some high cattle use (as measured by the LUI) in the riparian zone does not make it stream-side to cause increases in fine sediments (e.g. LaMarche, Jimmie New, State Creeks). A better correlated measure may be number of actual cattle-crossings.

Figure 2. Relationship between LUI and in-stream fine sediments. Correlation coefficient (r) shown. Circled sites represent high LUI in the riparian zone, but not stream-side.



High Ore Creek, Indian Creek and Camp Creek have lower habitat scores largely from old mining activities which have altered the stream channel, substrate and caused riparian vegetation removal, although obvious improvements have occurred. In terms of water quality parameters, relatively high conductivity ratings were reported at High Ore Creek, Indian Creek, Moose and Medicine Rock creeks (221-335 µS/cm) (Table 3). This would be expected from the streams with obvious mining in the basin, but Moose and Medicine Rock Creeks didn't appear to have conspicuous mining, but there may be old claims in adjacent upstream side drainages. Dissolved Oxygen was at the saturation point at most sites and was not a problem and the pH was within acceptable limits.

Table 3. Physical measures, water parameters and habitat descriptions for the seventeen study sites. LUI=Livestock Use Index, %RP_SH= % Riparian Shading, % LWD=percent of transects out of 10 with Large Instream Woody Debris present, Cond=Conductivity (µS/cm), DO=dissolved oxygen in (mg/L).

Site	Avg stream width (m)	Avg channel depth (cm)	Median channel depth (cm)	Reach Length (m)	EPA Habitat Quality Index (HQI)	BLM Site Evaluation	LUI	% RP_SH	% LWD	% boulder	% fines in reach	pH	Cond	DO	Water Temp ©
Bear Creek	1.8	20.2	20.0	200	182	23	0	75	30	0.0	5.0	8.5	61	12	13.6
Bigfoot Creek	1.3	9.9	10.0	100	155	16	58	75	40	12.0	12.0	7.7	158	9.7	8.7
Camp Creek	2.6	15.6	15.0	100	163	22	29	80	10	7.5	6.0	8.2	162	11	14.6
Deep Creek	9.7	48.3	43.5	250	175	15	47	10	30	2.0	5.0	7.9	66	10	15.5
Fish Creek	6.2	46.6	45.0	240	187	23	31	25	20	8.5	9.0	7.8	90	9	8.1
High Ore Creek	1.2	12.5	12.0	100	164	20	0	15	20	2.5	5.0	8.2	335	8.3	12.8
Indian Creek Trib	1.7	14.4	15.0	100	165	18	21	30	20	10.0	5.0	8.1	221	10	12.9
Jimmie New	1.6	13.2	12.0	100	174	21	41	50	20	<1	<1	7.9	35	12	11.1
LeMarche Creek	8.2	37.8	36.5	200	185	24	46	25	10	16.0	<1	7.7	30	14	11.3
Lump Gulch	2.6	17.2	16.5	150	188	23	0	60	10	27.0	0.0	8.0	123	10.5	15.7
Medicine Rock Creek	1.7	10.5	10.0	100	172	23	14	80	40	0.0	16.0	7.9	327	12	9.7
Moose Creek	3.5	15.7	15.0	200	178	23	0	50	30	20.0	<1	8.5	240	12	18
Muskrat Creek	3.2	25.0	23.5	150	188	23	0	75	30	47.0	1.0	7.6	78	14	9.4
Spring Gulch	0.8	11.3	10.0	100	154	16	60	40	20	10.0	7.0	8.0	207	9.5	15.4
State Creek	1.3	14.9	13.0	150	168	17	45	60	40	20.0	5.0	7.6	128	8	9.9
West Fork Jimmie New	0.7	5.1	4.0	100	185	24	0	60	10	5.0	5.0	8.2	130	14	11.6
Whitetail Creek	4.1	33.1	30.0	200	179	23	10	40	30	20.0	4.5	8.1	64	12	16.8

Macroinvertebrate Community Analysis

Macroinvertebrate taxa lists and individual abundances are presented for each sample in Appendix A. Overall, 89 taxa were reported from the 7 sites and the average macroinvertebrate taxa richness per site was 40.1. W.F. Jimmie New Creek had the highest taxa richness at 49 taxa and High Ore Creek the lowest with 21 taxa. Individual macroinvertebrate metrics are located in Appendix B. Macroinvertebrate samples taken at the seven sites were ranked non-impaired with their appropriate DEQ MMI index scores, accept Moose Creek which came out slightly-impaired. (Table 4). But when we ran the metrics for Moose Creek (on the border between Mtn & Lval) with the Low Mountain/Valley MMI, it came out highly-ranked unimpaired. This low gradient reach of Moose Creek is more indicative of a foothills stream rather than a higher gradient mountain stream class. Indian Creek which could also be considered a borderline Mountain site (based on elevation) ranked unimpaired with the MTN MMI, as well as the LVAL index. Moose Creek had the highest density of macroinvertebrates in the benthos, while Muskrat and Bigfoot Creeks supported the lowest number of inverts (Table 4). For the Mountain Sites, Muskrat and W.F. Jimmie New Creeks had the highest macroinvertebrate biological integrity scores, and State and Moose Creeks for the Low Mountain/Valley (Table 4). The macroinvertebrate results at High Ore and Muskrat Creeks are consistent with samples taken in 2003 at these same sites (BLM Buglab Report 2004).

Table 4. Overall macroinvertebrate results, macroinvertebrates identified, total taxa richness, percent sub-sampled, number of individuals in the sample, # individuals/m2, multimetric index for the Mountain and Low Mountain/Valley sites, P_A_T = points above the DEQ threshold and aquatic impairment status for each stream site.

Site	Macros ID	Total Taxa	% Sample Used	Total Ind Sample	Macros/m^2	Mtn MMI	P_A_T	Status
Indian Creek UP	566	44	37.5	1509.3	2028.7	72.1	9.1	Non-Impaired
Moose Creek	526	41	12.5	4208.0	4524.7	61.2	-1.8	Slightly-Impaired
Muskrat Creek	412	44	62.5	659.2	886.0	**81.3**	18.3	Non-Impaired
W.F.Jimmie New	600	49	25.0	2400.0	3225.8	**75.4**	12.4	Non-Impaired
	Macros ID	**Total Taxa**	**% Sample Used**	**Total Ind Sample**	**Macros/m^2**	**LowVal MMI**	**P_A_T**	**Status**
Bigfoot Creek	336	45	100.0	336.0	361.3	52.9	4.9	Non-Impaired
Indian Creek UP	566	44	37.5	1509.3	2028.7	53.3	5.3	Non-Impaired
High_Ore Creek	600	21	25.0	2400.0	3225.8	52.7	4.7	Non-Impaired
Moose Creek	526	41	12.5	4208.0	4524.7	**62.1**	14.1	Non-Impaired
State Creek	482	37	37.5	1285.3	1382.1	**63.1**	15.1	Non-Impaired

SITE PHOTOS & DESCRIPTIONS

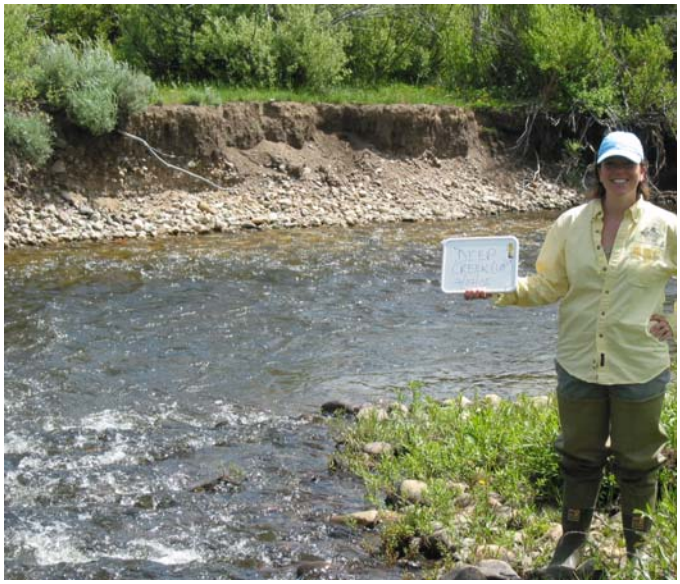
Bear Creek-dense (impenetrable in places) willow/alder riparian area, good in-stream substrate with some LWD, minimal livestock use, an old cattle-crossing was slightly widened (where photo is taken). Some old logging in the adjacent (within 30m) left bank riparian area.

Bigfoot Creek- dense alder/willow/poplar riparian area, lots of LWD in the stream channel (right photo), decent boulder/gravel substrate away from the cow crossing areas. Extensive livestock use, pocking, trails and browsing in the riparian area. Silted areas at the cow-crossings and LWD areas.

SITE PHOTOS & DESCRIPTIONS (CONT.)

Camp Creek- dense alder/rose/willow riparian area, some LWD in the stream channel (no photos), Decent cobble/gravel substrate. Extensive livestock use on the right bank. Old mine tailings piles and road embankment on the left bank. Silted areas at the wood debris jams.

Deep Creek-the largest Big Hole tributary sampled, 4th order. C3 (riffle/run/pool) geomorphology and cobble/gravel dominated substrate. An increase in fine sediments in the depositional pool areas, largely due to bank stability/cow trampling issues upstream. Left bank riparian habitat is in decent shape, right bank has significant areas of erosional damage (left photo). High quality trout habitat within this reach, plenty of fish holding pools >50 cm.



Fish Creek- B3-C3 riffle/run/pool geomorphology with boulder/cobble dominated substrate. Rock chasm at the top of reach (left photo). Left bank riparian habitat is in better shape. High quality trout habitat within this reach, numerous fish holding pools >50 cm. Some old logging in the adjacent (within 30m) right bank riparian area.

SITE PHOTOS & DESCRIPTIONS (CONT.)

High Ore Creek-riffle/run geomorphology and highly embedded, "armored" cobble (really had to rake it out to get a sample) and some loose gravel substrate. Left bank riparian habitat is recovering from mine tailings while the right bank is in better shape (left photo). Some old logging in the adjacent (within 30m) left bank riparian area as well. Caught an introduced brook trout in the dipnet while taking the macroinvertebrate sample (Right photo).

High Ore Creek-bottom of reach looking downstream.

Indian Creek-bottom of reach looking upstream.

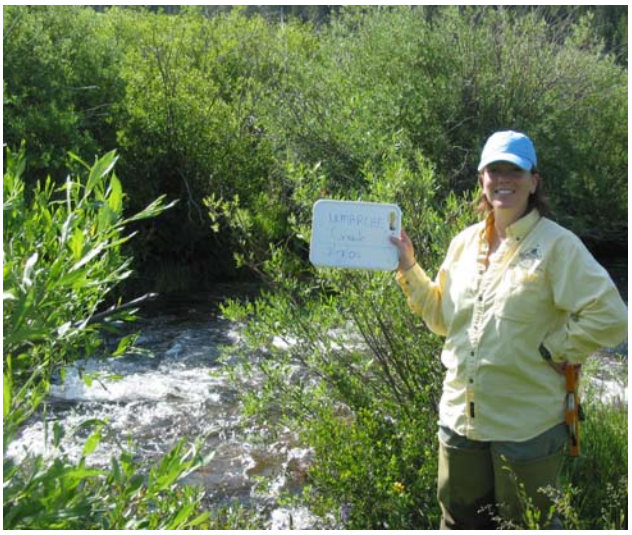
SITE PHOTOS & DESCRIPTIONS (CONT.)

Indian Creek-minimal riparian vegetative area except in the upstream portion of reach, some LWD in the stream channel (left photo). Decent cobble/gravel substrate not embedded and macroinvertebrate sample showed no impairment, but this site is still recovering from old mining and substrate removal from the channel. Old tailings piles and road embankment on the right bank looking upstream.

Jimmie New Creek –Decent cobble/gravel substrate away from the cow crossing areas. Grassy/ shrub riparian area with evidence of old logging (left photo). Moderate livestock use (pocking, stream widening and browsing) in the riparian area of the upstream reach section (right photo).

SITE PHOTOS & DESCRIPTIONS (CONT.)

LaMarche Creek- C3 riffle/run/pool geomorphology and cobble dominated substrate (left photo). Riparian habitat is dominated by willow and alders (right photo). Some extensive cattle trails and browsing through the riparian area, but little direct impact on the streamside banks. High-quality macroinvertebrate & trout habitat within this reach, plenty of fish holding runs >30 cm deep. A revisit in August revealed no western pearlshell mussels in the reach.



Lump Gulch-B2 Rosgen step-pool geomorphology and high % of canopy cover (left photo). High quality trout habitat within reach, numerous fish holding pools >30 cm (right photo), and saw trout darting for cover as I sampled. Intact riparian zone with one eroding portion of the bank on the road side (right bank).

SITE PHOTOS & DESCRIPTIONS (CONT.)

Medicine Rock Creek-dense (impenetrable in places) hawthorn/alder riparian area, good in-stream substrate within the narrow single thread channel with some LWD widening some areas. Trout (likely brook trout) seen in the pool formed from a LWD debris dam. Minimal livestock use in the right riparian (old cowpies). Old mining areas upstream and side slope areas to the north of the site across the road.

Moose Creek-downstream from Humbug Spires trailhead. Intact *Cornus* /alder riparian area, good cobble/gravel substrate (left photo), minimal livestock use. Reference condition C3 low gradient reach, with some bouldered, trout-holding pools (right photo) and sculpin *(Cottus bairdi)* darting around.

SITE PHOTOS & DESCRIPTIONS (CONT.)

Muskrat Creek-downstream end of reach is just up from the trailhead parking area (cover photo). Intact *Cornus* /alder riparian area, great boulder/cobble/gravel substrate, B2-B3 rosgen step-pool geomorphology, minimal/none livestock use. Reference condition moderate-high gradient reach, with trout-holding pools and mottled sculpin *(Cottus bairdii)* darting around.

Spring Gulch –Decent cobble/gravel substrate away from the cow crossing areas. Grassy/ shrub riparian area (left photo). Extensive livestock use (pocking, widening and browsing) in the riparian area of the upstream reach section (right photo).

SITE PHOTOS & DESCRIPTIONS (CONT.)

State Creek –B2 boulder/gravel substrate away from the cow crossing areas which have become slightly widened. Alder/ shrub riparian area (left photo). Extensive blockage of parts of the reach by boulders & LWD, trout using this cover, saw many darting underneath (right photo).

West Fork Jimmie New Creek-A narrow, single-thread channel with good cobble/gravel substrate and some LWD, flowing within a nicely wooded gulch. Minimal livestock use.

SITE PHOTOS & DESCRIPTIONS (CONT.)

Whitetail Creek- C3 riffle/run/pool geomorphology and cobble dominated substrate. Left bank riparian habitat has higher integrity. Quality trout habitat exists within this reach, plenty of fish holding runs, LWD & pools >50 cm.

CONCLUSIONS & RECOMMENDATIONS

Livestock grazing and other anthropogenic activities continue to destroy riparian corridors along streams and other water bodies in the west. Riparian zones are not only highly diverse ecotones, but they represent the last interface before particles and terrestrial inputs enter the aquatic ecosystem. To maintain aquatic habitat integrity, 10-30 meters (35-100ft) of native riparian buffer should be preserved along all streams, including intermittent and ephemeral channels (Naiman and DeChamps1997). In heavily grazed areas of the west, fenced areas that restricted animals from the riparian zone showed improved stream bank integrity and far less bank failure, thus minimizing erosion (Beschta & Platts 1986).

Since this study and others show causal links between livestock use and grazing in the riparian zone to lower riparian habitat quality indices and higher levels of in-stream fine sediments, the only recommendation would be to minimize the exposure of sensitive riparian areas to cattle disturbances. In areas of severe bank erosion, bank stability measures (e.g. vegetation replanting or structural supports) could be employed to reduce sediment inputs to the stream.

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